

What is claimed is:

1. An inspection probe for inspecting a surface finish of a machined surface, the probe comprising:
  - a laser directing a laser beam perpendicularly to the machined surface;
  - an optical detector positioned at an angle to the laser beam to detect scattered laser light from the surface;
  - a computer system including software that compares the detected scattered light to a scattered light signature from a first-type finishing mark and to a scattered light signature from a second-type finishing mark and determines a condition of the surface finish.
2. The probe of claim 1, wherein the optical detector is a photodiode or photodiode array.
3. The probe of claim 1, wherein the optical detector is a line-scan detector.
4. The probe of claim 1, wherein the machined surface is a cylinder bore for an engine block.
5. The probe of claim 4, wherein the first-type finishing mark is coarser than the second-type finishing mark.
6. The probe of claim 4, further comprising an optical device for directing the laser beam from the laser perpendicularly to the machined surface.

7. The probe of claim 6, wherein the optical device is a pentaprism.
8. The probe of claim 6, wherein the laser and the optical device are supported inside a tube.
9. The probe of claim 8, wherein the tube is mounted on a support shaft.
10. The probe of claim 9, further comprising a power device transmitting power to the laser and the detector and transmitting data to a computer, the power device being mounted on the support shaft.
11. The probe of claim 10, further comprising a detector electronics device mounted on the support shaft.
12. The probe of claim 11, wherein the shaft is rotatably supported on a tool holder.
13. The probe of claim 12, wherein the tool holder is supported on a spindle.
14. The probe of claim 12, wherein the spindle is supported on a CNC machine.
15. The probe of claim 14, wherein the CNC machine is programmed to sequentially inspect the cylinders of an engine block.

16. The probe of claim 14, wherein the spindle is supported on a multi-probe inspection machine.
17. The probe of claim 16, wherein the inspection machine is a reconfigurable inspection machine.
18. The probe of claim 4, further comprising a filter in front of the detector to reduce unwanted light.
19. The probe of claim 4, wherein each scattered light signature is distinguished by characteristic peaks of scattered light.
20. The probe of claim 11, wherein the detector electronics device include signal amplification.
21. The probe of claim 4, where the machined surface is metallic.
22. A method for inspecting the surface finish of a machined surface, the method comprising:
  - directing a laser beam perpendicularly to the machined surface;
  - detecting a scattered laser beam light from the machined surface;
  - determining a signature of the detected scattered laser beam light; and
  - determining a condition of the machined surface from the signature.

23. The method of claim 22, wherein the machined surface is a cylinder bore.

24. The method of claim 23, wherein determining a signature includes determining a characteristic peak of the detected scattered laser beam light.

25. The method of claim 23, wherein determining a condition includes determining a type of machining mark.

26. The method of claim 24, wherein determining a signature includes comparing a scattered light signature from a first-type finishing mark to a scattered light signature from a second-type finishing mark.

27. A reconfigurable inspection apparatus for inspecting the surface finish of a plurality of machined surfaces in a part, the inspection apparatus comprising:

a reconfigurable multi-spindle apparatus having a plurality of spindles;

a plurality of inspection probes rotatably and movably supported on corresponding spindles, each inspection probe comprising:

a laser that directs a laser beam perpendicularly to the machined surface;

a detector positioned at an angle to the laser beam to detect scattered laser light from the surface; and

a computer system including software that compares the detected scattered light to a scattered light signature from a first-type finishing mark and to a scattered light signature from a second-type finishing mark and determines a condition of the surface finish.

28. The inspection apparatus of claim 27, wherein the machined surfaces are cylinder bores and the part is an engine block.

29. The inspection apparatus of claim 28, wherein the distance between any two inspection probes is changeable without removing the corresponding spindles from the inspection apparatus.

30. An inspection probe for inspecting a surface finish of a machined surface, the probe comprising:

- a laser directing a laser beam perpendicularly to the machined surface;

- a detector positioned at an angle to the laser beam to detect scattered laser light from the surface;

- a computer system including software that compares the detected scattered light to a scattered light signature from a first-type finishing mark and determines whether the first-type finishing mark is present.

31. An inspection probe for inspecting a surface finish of a manufactured surface, the probe comprising:

- a laser directing a laser beam perpendicularly to the manufactured surface;

- an optical detector positioned at an angle to the laser beam to detect scattered laser light from the surface;

a computer system including software that compares the detected scattered light to a scattered light signature from a first-type finishing mark and to a scattered light signature from a second-type finishing mark and determines a condition of the surface finish.

32. The inspection probe of claim 31, wherein the first and second finishing marks correspond to finishing marks before and after a removal of material.

33. The inspection probe of claim 31, wherein the first and second finishing marks correspond to finishing marks before and after an addition of material.